Two-Year Follow-Up of the First Transanal Total Mesorectal Excision (TaTME) Case Performed in Community Hospital in Hawai'i: A Case Report and Literature Review

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Abstract

Surgical management of rectal cancer has evolved with the advent of total mesorectal excision (TME) and neo-adjuvant treatment allowing for more sphincter-preserving proctectomies. The laparoscopic approach to TME has numerous advantages over the open approach, including faster recovery, fewer wound complications, and overall reduced morbidity. However, laparoscopic dissection around the distal portion of the rectum is particularly difficult, and thus makes achieving TME completeness and negative resection margins for low rectal tumors a challenge. Transanal TME (TaTME) is designed to overcome these difficulties. It is performed in addition to laparoscopic operation as a bottom-up approach facilitating dissection around the distal rectum. More importantly, TaTME has been shown to have the potential to improve oncological outcomes of minimally-invasive sphincter-preserving proctectomy by providing better TME specimen quality and resection margins. Although interest in TaTME has been growing worldwide, the technique is still relatively new, and adoption into routine practice may be challenging. Potential criteria for successful adoption of the TaTME technique include experience in laparoscopic rectal resection and transanal minimally-invasive surgery (TAMIS), cadaveric TaTME training, and a multidisciplinary approach to selection and management of patients with rectal cancer. Once these criteria are met, gradual and careful implementation of TaTME could be feasible. This report describes the 2-year follow-up of the first TaTME case in Hawai'i managed by a multidisciplinary oncological team in a community hospital setting.

Keywords

Transanal Total Mesorectal Excision, Sphincter Preserving Proctectomy, Hawai'i, Community Hospital

Abbreviations and Acronyms

ACOSOG = American College of Surgeons Oncology Group
ALaCaRT = Australian Laparoscopic Cancer of the Rectum Trial
CEA = carcinoembryonic antigen
COLOR = Colorectal Cancer Laparoscopic or Open Resection
CRM = circumferential resection margin
DRE = digital rectal exam
DRM = distal resection margin
ETAP-GRECCAR = Endoscopic Transanal Proctectomy Versus Laparoscopic Proctectomy for Low-Lying Rectal Cancer
HMC = Hilo Medical Center
IMA = inferior mesenteric artery
LaTME = laparoscopic total mesorectal excision
MRI = magnetic resonance imaging
NCCN = National Comprehensive Cancer Network
OpTME = open total mesorectal excision
PE = physical exam
POD = postoperative day
ROLARR = Robotic vs Laparoscopic Resection for Rectal cancer
QOL = quality of life
TAMIS = transanal minimally invasive surgery
TaTME = transanal total mesorectal excision
TES = transanal endoscopic surgery
TME = total mesorectal excision

Introduction

Anal sphincter-preserving proctectomy with total mesorectal excision (TME) remains the mainstream surgical management of patients with stage I to III mid and low rectal cancer.[1,2] Minimally-invasive approaches offer faster recovery, lower morbidity, and comparable oncological results.[3,4] Transanal TME (TaTME) was designed to overcome technical difficulties of transabdominal (laparoscopic or open) dissection around the distal rectum as an additional "bottom-up" approach to TME.[5,6,7] Two highly debated prospective studies, the Australian Laparoscopic Cancer of the Rectum Trial (ALaCART) and the American College of Surgeons Oncology Group (ACOSOG) Z6051 Randomized Clinical Trial, comparing open and laparoscopic sphincter preserving proctectomy techniques failed to demonstrate non-inferiority of laparoscopic approach due to higher number of patients with positive distal resection margin (DRM) in laparoscopic branches.[8,9] TaTME allows for higher certainty in obtaining a negative distal margin due to direct visualization of the rectal mucosa, which remains problematic for a pure laparoscopic approach.[6] Another unique advantage of the TaTME technique is creating reliable circular colorectal anastomosis by avoiding multiple staple load use, which may reduce the risk of anastomotic leak.[10,11] This report is a 2-year follow-up of a case of stage III low rectal adenocarcinoma treated by multidisciplinary oncological approach incorporating the TaTME technique.

Case Report

A 78-year-old woman presented to a community hospital with rectal bleeding. Her physical exam (PE) was unremarkable, but on digital rectal exam (DRE), she had a palpable partially fixed large polypoid mass at 6 cm from the anus. A colonoscopy showed a large fungating, malignant-appearing mid-rectal mass occupying two-thirds of the rectal lumen. A biopsy revealed a moderately differentiated adenocarcinoma. Staging CT scan showed no distant liver metastases or lymphadenopathy. Carcinoembryonic antigen (CEA) level was 5.2 ng/mL (normal range in adult non-smokers: 0–2.5 ng/mL). An imaging of the pelvis using magnetic resonance imaging (MRI) demonstrated

a T3 tumor invading into perirectal fat and enlarged perirectal lymph nodes. Given these findings, her pretreatment stage was defined as IIIb (T3N1M0).

The case was discussed at a multidisciplinary tumor board meeting with a recommendation of chemoradiation followed by restaging and possible sphincter-preserving proctectomy for the cure. The patient underwent neoadjuvant treatment, including concurrent Capecitabine 650 mg bid for 6 weeks and fractioned pelvic radiation with 25 rounds of 180 centiGray (cGy) x25, and a rectal boost with 3 rounds of 180 cGy, resulting in a total of 5040 cGy.

Restaging demonstrated no metastatic lesions, rectal mass shrinkage, and normalization of CEA level. On exam during her preoperative visit 12 weeks after completion of chemoradiation, she had a small (0.3 cm) residual nodule palpable during a DRE. The area was mobile with the rectal wall.

The patient was elected to be a favorable candidate for TaTME. She underwent laparoscopic mobilization of the left colon and splenic flexure, followed by TaTME using a transanal port with gel cap and pressure maintaining insufflation system. Conventional laparoscopic instruments and a 5-mm laparoscope were used for transanal dissection. Visually adequate distal margin and TME were achieved. In continuation with the previously mobilized sigmoid colon, the dissected rectum was retrieved through the dilated anal canal protected by a plastic wound retractor. This specimen retrieval technique eliminated the need for an abdominal access incision. The specimen was resected at the recto-sigmoid level and removed, completing sphincter preserving proctectomy. An intact mesorectal envelope of the resected specimen was demonstrated on the back table.

A 6-cm sigmoid J-pouch was created outside the anal canal to compensate for rectal volume. The sigmoid pouch was pushed back into the pelvic cavity through the anal canal. A circular stapling colorectal anastomosis was then performed to the remaining rectal cuff under laparoscopic control. The operation was completed by creating a diverting ileostomy using the largest laparoscopic port (12 mm). The two other ports were 5 mm, thereby minimizing transabdominal incisional trauma. Estimated blood loss was 20 mL, and the total operative time was 310 minutes.

The patient was able to ambulate on the same day after the operation and required no opioids for pain control. Her ileostomy started to work normally on postoperative day (POD) 1. She was discharged home on POD 2 without pain medication and on a regular diet. At her 2-week postop follow-up visit, she felt well with a normal appetite and ileostomy function and was able to perform normal daily activities.

Histological examination of the resected rectal specimen demonstrated complete pathological response with no residual tumor detected, intact mesorectal envelope containing 8 lymph nodes, which were all negative for metastatic spread (pT0, N0). The pathologist performed an extensive search to elicit additional lymph nodes in the available mesorectal fat. The radiation effect to the rectum and mesorectal tissue was noted; all margins, including distal and circumferential, were negative. Upon reviewing the surgical and histological findings, the multidisciplinary tumor board's recommendation was not to proceed with adjuvant chemotherapy because of the complete clinical and pathological response and the R0 resection.

The patient underwent uneventful ileostomy reversal 3 weeks after proctectomy. After the ileostomy reversal, she demonstrated bowel function return on POD 2 and was discharged home. She recovered well from this operation, regained weight, and had good bowel function at her 2-week postoperative visit.

The patient was followed up at 3, 6, 12, and 18 months with periodic PE, DRE, and CEA serum levels. At the 2-year follow-up visit, she had a normal PE, DRE (with palpable patent anastomosis), laboratory workup, and CEA level. The patient had no complaints, reported nearly normal bowel function with 2 to 3 bowel movements daily, good anal sphincter control, and a normal quality of life.

Discussion

TaTME Versus Laparoscopic and Robotic TME Techniques

Incorporating TaTME into the multidisciplinary treatment of rectal cancer has recently gained popularity due to the potentially unmatched oncological advantages of this technique, specifically for distally located tumors.[12] In TaTME, the rectal mucosa and distal tumor margin are directly visualized, and a purse-string suture is placed to close the lumen beyond the tumor. A full-thickness proctotomy is performed starting at the mucosa layer, tailoring the distal resection margin even for very low tumor locations. Once the distal margin is addressed, the TME is then performed in a caudal to cranial direction, eventually meeting the laparoscopic dissection plane. Not surprisingly, earlier TaTME studies demonstrated zero rates of positive distal margins in resected specimens.[5,6] The anastomosis is then created with a circular stapler when the rectum wall is purse stringed around the anvil, leaving no "ears", corners, or crossed staple lines. This anastomotic technique leaves only a circular staple line, potentially reducing the risk of anastomotic leak.[11] Pure laparoscopic TME may be very difficult, especially in cases with the narrow pelvis or obese male patients. The difficulties of dissection with long straight laparoscopic instruments in the low pelvis are defined by an upward curving of the distal rectum in a narrow space. Even when performed by high-volume laparoscopic colorectal surgeons, these difficulties and the need to use multiple staple loads for rectum transection correspond to a higher number of resections with positive distal margins and subsequent conversion to open procedures.[3,4,8,9] Robotic-

assisted technique offers improved dexterity and accessibility to the distal rectum and may reduce the rate of conversion.[13] However, the robotic approach does not provide any advantage in distal rectum transection as it still requires stapling across the rectum using multiple staple loads, similar to the laparoscopic approach. In a large scale randomized study comparing the results of laparoscopic and robotic rectal resections performed by surgeons with varying experience in both techniques (Robotic vs Laparoscopic Resection for Rectal cancer [ROLARR] trial), no difference in outcomes, including resection margins, was observed.[14]

Quality of Resected Specimen

A better specimen quality, consisting of TME completeness and negative margins, might be one of the potential benefits of the TaTME technique.[15,16] Incomplete excision of the mesorectum is a known risk factor for local and overall recurrence.[1,17] Circumferential resection margin (CRM) is an important indicator of TME quality. Involvement of CRM within 2 mm is associated with a local recurrence risk of 16% compared to 5.8% in patients with CRM greater than 2 mm.[18] In a randomized study of 100 patients with low rectal lesions (<6 cm from the anus), positive circumferential resection margins were found to be significantly better when TME was performed via transanal approach as opposed to that of transabdominal (4% versus 10%).[19] A case-matched study comparing TaTME (n=100), laparoscopic TME (LaTME; n=100), and open TME (OpTME; n=100) showed that TaTME resulted in lower rates of incomplete TME specimens than LaTME (P=.016). But, when TaTME was compared to OpTME, the difference did not reach statistical significance (P=.750).[20] A meta-analysis of 10 studies with 762 patients revealed that TaTME had longer CRM (P<.001), a lower positive rate of CRM (P<.047), and a longer distal resection margin DRM (P<.019) as compared to those of laparoscopic TME.[16] An ongoing prospective study with strict inclusion criteria, standardized technique, and perioperative MRI focusing on CRM may further clarify if there is any advantage of TaTME in regards to better specimen quality and to what degree it corresponds to local recurrence rate and other outcomes.[21]

Long-term Oncological Outcomes

The most extensive study to date on long-term oncological outcomes of TME via transanal approach to date was published in 2017 by Marks and colleagues.[22] They followed 373 patients over 5 years, two-thirds of whom were challenging patients such as men with a narrow pelvis, patients with an elevated body mass index, and tumors in the lower third of the rectum. Remarkably, 76% were stage III, and 53% were fixed lesions at presentation. All patients received neoadjuvant treatment and then a diverting ileostomy during surgery. Although the overall local recurrence rate was 7.4%, this was only 4.3% in the laparoscopic abdominal approach group versus 10.8% for the open approach group. Ninety percent 5-year overall survival rate was achieved.

Impressive long-term results have recently been demonstrated in a two-center study from the Netherlands on 159 consecutive mid and low rectal cancer patients. Remarkably, the majority of patients had stage III cancer (T2-3, N1-2), and some (4.4%) had M+ disease (distal metastases) as patients for curative resection of synchronous liver metastasis were included. All patients received neoadjuvant therapy and underwent TaTME with curative intent. The 3-year local recurrence rate was 2%, and the 5-year local recurrence rate was 4%. Disease-free survival was 92% at 3 years and 81% at 5 years.[23]

More data on long-term outcomes of the TaTME approach are underway. The results of Colorectal Cancer Laparoscopic or Open Resection (COLOR) III randomized study designed to assess CRM in laparoscopic TME versus TaTME are awaited. This study will include preoperative and postoperative MRI assessment. Local recurrence rate and long-term oncological outcomes of TaTME will be assessed in relation to margins involvement.[21] A non-inferiority randomized controlled trial called Endoscopic Transanal Proctectomy Versus Laparoscopic Proctectomy for Low-Lying Rectal Cancer (ETAP-GRECCAR) 11 will compare TaTME to laparoscopic TME and include patients with T3 lesions in the lower-third rectum. The main endpoint will be R0/R1 resection with follow-up for 3 years.[24]

Functional Outcomes

Up to 60% of patients after rectal cancer surgery report problems with anal sphincter control, sexual and urinary dysfunction, and psychological issues.[25] Damage to pelvic nerves is associated with sexual and urinary dysfunction.[26,27] One of the potential advantages of TaTME over conventional laparoscopic technique is better visualization of the pelvic nerves.[28] Natural drawbacks of the TaTME technique include prolonged anal dilatation and lower anastomosis, which could adversely affect functional outcomes.[29]

In 1 study evaluating functional outcomes of 10 patients undergoing TaTME, pelvic autonomic nerve preservation was intraoperatively assessed with electromyography of the anal sphincter and a cystomanometry using electric stimulations. A variety of functional scores were evaluated preoperatively and postoperatively. Although sexual function and bowel function scores were lower postoperatively, the potential for good function preservation with the TaTME technique was noted.[30]

A study of 30 patients who underwent TaTME and were followed with explicit quality of life (QOL) questionnaires 1 week preoperatively and at 1 and 6 months postoperatively demonstrated that incontinence and dysuria did not change significantly after TaTME. Sexual function deteriorated at 1 month but returned to baseline at 6 months. The authors concluded that functional

outcomes and QOL after TaTME were acceptable and comparable to those of conventional laparoscopic TME.[31]

In a review article by De Nardi, 7 studies addressing QOL and functional outcomes of TaTME were analyzed; most studies reported good outcomes, but each had a small number of patients, and comparative data were lacking.[32] There is a need for larger-scale research. The ongoing COLOR III study is set up to have questionnaires assessing QOL and functional outcomes at 1, 3, 6, 12, 24, and 36 months postoperatively.[21] These results may provide a more meaningful assessment of these important aspects of the TaTME technique.

Minimizing of Transabdominal Incisional Trauma

In rectal cancer surgery, a laparoscopic approach is associated with reduced overall complication rates, blood loss, length of hospital stay, and earlier bowel function return.[4] However, specimen retrieval usually requires an additional abdominal incision, which is associated with wound-related complications.[33] In TaTME with a laparoscopic abdominal approach, the specimen could be retrieved transanally or via additional suprapubic incision.[34] The latter method is more suitable for a bulky specimen, long narrow pelvis, or relatively short sigmoid colon.[35,36] In turn, the former approach allows for the elimination of the access incision, leaving only small port incisions and ileostomy.[5] Avoiding incisional trauma including muscle/fascia transection and subsequent suture closure may correspond to earlier patient activation, bowel function return, reduction of wound complication risk and opioid use, as occurred with the patient in this report. However, transanal specimen extraction is not always possible. One should consider this with caution giving priority to oncological safety, good perfusion of sigmoid conduit, and tension-free anastomosis while ensuring adequate left colon length achieved by laparoscopic mobilization.[35,36]

Areas of Concern

TaTME is a relatively new technique. Several complications have been reported, including injury of the urethra, urinary bladder, prostate, pelvic nerves, or gas embolism.[30,37,38] As the method has been gradually adopted, there are some reservations about using it widely outside of specialized high-volume centers.[34] Nevertheless, there is increasing interest in learning of TaTME technique worldwide. Several hands-on courses led by world experts are offered and attended by increasing numbers of interested surgeons.[39]

Main intraoperative difficulties may arise from developing incorrect points of dissection as areolar planes created by pneumopelvis may be misleading.[36] If an incorrect plane is entered posteriorly, presacral bleeding may occur, laterally—pelvic sidewall and hypogastric nerve injury, anteriorly—urethra or prostate injury in men.[40] Technical aspects of the bottom-up dissection and correct anatomy and plane recognition could be significantly improved after hands-on training in a cadaveric lab.[39] The importance of a proper training pathway before the incorporation of TaTME into clinical practice has been emphasized.[34,36]

Lessons from the early experience of TaTME in Norway with multifocal local recurrences are now carefully reviewed. Many of them may be related to the procedure's technical aspects, such as open rectal transection and gas flow during TaTME and inadequately tightened purse-string suture that may contribute to spillage of tumor cells.[41,42] Some experts advocate reinforcement of the purse-string closure of the rectum for airtight closure by the placement of a second purse-string suture and washing with a tumoricidal solution to avoid potential tumor spillage and implantation.[43] Essential skills on endoscopic purse-string closure could be developed during cadaveric step-up training.[39,44] Other issues with earlier Norwegian experiences include fragmented experience at multiple facilities and underutilization of neoadjuvant treatment.[41,42,45] Strict adherence to established guidelines on the neoadjuvant treatment of patients with rectal cancer and technical steps of the TaTME procedure may be pivotal.

The learning curve for the TaTME technique could vary and likely depends on individual surgeon experience in laparoscopic colorectal surgery and transanal minimally invasive surgery (TAMIS) or transanal endoscopic surgery (TES).[46,47] The wide range of reported case volume sufficient for proficiency may be explained by the absence of an accurate way to evaluate proficiency in TaTME.[34,35,47] Also, experience from high volume academic centers where cases are bundled among several operators and their trainees cannot be generalized or applicable to community centers where specialized procedures are often concentrated to one set of hands. When TaTME is performed by a single experienced surgeon, operative time can be significantly reduced after the first 4 cases.[48] Individual data on outcomes, such as anastomotic leak rate and functional outcomes, may serve as a proxy for clinical effectiveness in TaTME procedure.[47]

Feasibility of Performing TaTME at a Community Hospital

For those surgeons who routinely practice laparoscopic rectal resection for cancer with sphincter preservation in community settings, the TaTME technique may become a valuable part of a surgeon's armamentarium. Bottom-up dissection facilitates excision of the lower third of the rectum. Better visualization of low pelvic structures, distal margin control, and potentially safer anastomosis are particularly appealing.

Could TaTME be safely implemented in a community center with a well-established oncological colorectal care? Unfortunately, due to the lack of randomized data, there are no uniform criteria for safe TaTME practice.[34,35] Some of the expert groups define these criteria as the following: expertise in TME, laparoscopic colorectal surgery, TAMIS, and intersphincteric dissection. Practicing in cadaver models, proctoring the first

cases by experts in the field, and entering data in a registry are advocated.[44,46] The role of the multidisciplinary team in patient selection is emphasized.[36,49]

In the East Hawai'i community, there has been a well-established colorectal oncological service. Relative geographic isolation and coverage of the major portion of the island population provide a steady volume of patients with rectal cancer presenting to Hilo Medical Center (HMC). All cases are managed by a multidisciplinary team, including a radiation oncologist, medical oncologists, radiologists, pathologists, and general surgeons who practice laparoscopic colorectal resection. The patients with potentially resectable lesions and clinical stage II and III undergo neoadjuvant chemoradiation. All low rectal resections and TME are performed by a single established team of 2 surgeons. The operating surgeon is trained in minimally-invasive surgery, has 2 decades of experience in colorectal resections, and underwent training courses on TaTME, including a 3-day hands-on cadaveric course. Pathology evaluation of TME specimens in HMC has been performed based on The National Comprehensive Cancer Network (NCCN) recommended principles of pathological review. Specific attention is paid to TME completeness on gross examination and CRM and DRM distances.

TAMIS was implemented in routine practice in HMC 5 years ago. Multiple cases for benign and T1 rectal lesions have been performed since using GelPOINT access platform (Applied Medical, Rancho Santa Margarita, CA) and Airseal system (CONMED, Utica, NY) for steady insufflation. These 2 platforms are used for TaTME by a majority of experts.[35] In the laparoscopic approach, mobilization of the splenic flexure, high ligation of inferior mesenteric artery (IMA), and diverting ileostomy is routinely performed according to the recommended steps by a majority of expert groups.[35,36,50] An enhanced recovery protocol is implemented in all patients postoperatively, which includes early feeding, ambulation, and limited opioid use.

The patient for the pilot TaTME case was chosen after a careful patient selection process. The potential candidates were discussed at the multidisciplinary tumor board. The specific goal was to assure technical success and acceptable long-term results of the first TaTME case before the broader implementation of this technique in the settings of HMC. In preparation for the case, the operating surgeon completed the last hands-on TaTME course 2 weeks before the scheduled date of operation. An extensive review of video cases, including pitfalls and errors, was performed. Although proctoring by direct intraoperative observation was not feasible due to organizational difficulties, the case and detailed operative plan were discussed with a world expert, who was readily available by phone during the operation. There were no intraoperative issues or significant deviations from the discussed plan. The early results of the first Hawaiian TaTME case performed in 2017 (blood loss, operative time, TME completeness) were remarkably similar to those of the first reported by Lacy's group (2010), and comparable to those of the first case in the United States (2016) as reported by McLemore et al.[5,46] Furthermore, at 2-year follow up this patient remains free of the disease with good functional outcome.

Conclusion

Adopting the TaTME technique in community hospitals could be feasible if an appropriate training pathway and a multidisciplinary approach are implemented. Although the long-term oncological and functional outcomes of our first TaTME case are encouraging, case series with a higher number of patients and long-term outcome data will be required to demonstrate comparable results to published data. A careful balance between sufficient safety and adequate efficacy of practicing of TaTME technique at a community hospital should be maintained.

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